implications for identifying social stratification specific activities, although with some limit.
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The biomechanics of balance in common marmosets (*Callithrix jacchus*)

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A central problem for primates travelling on narrow branches is the management of disruptive rolling torques about the support. However, few quantitative data exist with which to evaluate the biomechanical strategies primates use to manage torques and maintain balance. To address this gap, we collected high-speed video of two common marmosets crossing an array of six custom-built force transducers fitted with broad (5cm) and narrow (2.5cm) diameter poles. By examining both applied torques and disruptive gravitational torques about the poles, we test two hypotheses: 1) left and right limbs exert equal and opposing torques, thus ensuring low net torque across a stride, and 2) disruptive gravitational torques will be inversely related to pole diameter, requiring significantly greater balancing forces (i.e., applied torques divided by the support radius). A preliminary dataset of 14 strides on the broad pole and 9 on the narrow indicates that right- and left-side torques have opposing orientations but similar magnitudes (right: 0.550 Ncm; left: -0.381 Ncm; $p>0.05$), resulting in low mean torque that does not differ between substrates (5cm: -0.149 Ncm, 2.5cm: -0.048 Ncm; $p=0.73$). Disruptive gravitational torques are greater on the narrower pole (5cm: 4.13 Ncm, 2.5cm: 1.28 Ncm), though not significantly so ($p=0.167$). Requisite balancing forces, however, are nearly six times greater on the narrow support, a significant difference (5cm: 3.27N, 2.5cm: 0.56 N, $p=0.025$). On-going analyses incorporating limb kinematics and kinetic measurements are focused on the degree to which grasping forces and segmental accelerations (e.g., tail movements) determine torque cancellations across the stride.
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Out on a limb: Developmental rules for the evolution of primate segment proportions

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The proportions of the bones comprising the individual limb segments (stylopod: humerus, femur; zeugopod: radius/ulna, tibia/fibula; autopod: metapodials, digits) reflect the summed effects of developmental factors on relative size, from earliest limb bud outgrowth, patterning and segmentation, to fetal and postnatal endochondral bone growth. However, it is unknown to what degree any individual event contributes to variation, and thus when and what selection may act upon to generate evolutionary change. Comparative analysis of macroevolutionary diversity of amniote limb proportions indicates that early processes of proximo-distal patterning and segmentation limit the initial middle (zeugopod) segment proportions (~1/3 of total limb length) and thus the available variation, suggesting that deviations from this pattern must be generated by selection on variation in later growth. To address this hypothesis in primates, population-level data was collected for mean and variance in segment proportions compared within and among groups (species=71, limbs=140). Ontogenetic variation in proportions in humans, gorillas, gibbons, and galagos across fetal and postnatal growth was also examined. Results indicate that, as in other amniotes, variation in the middle segment exhibits reduced variance throughout development and averages ~1/3 of total limb length. Consistent with model predictions, primates exhibit deviations from initial middle segment proportions during later fetal and postnatal somatic growth. These results suggest that primates, including humans, escape early developmental constraints on middle segment proportions primarily via selection on variation in differential endochondral growth processes.
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Assessing the risks of maternal placentophagy: An analysis of environmental metals in human placenta capsules

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Maternal placentophagy, postpartum ingestion of the afterbirth by the mother, is ubiquitous among mammals but conspicuously absent in the ethnographic literature. One explanation for this absence suggests that with the emergence of regular fire use by human ancestors, smoke inhalation during pregnancy may have rendered placentophagy harmful due to metal accumulation in the organ. Despite a lack of evidence for maternal placentophagy in the cross-cultural record, it has recently become popular among a small but growing number of women in industrialized countries. Among these women, placenta is often ingested in dehydrated and encapsulated form and taken across the postpartum period for its many purported benefits. The effects of ingesting dehydrated placenta have not been systematically investigated, and the heavy metal content of processed placenta has never been explored. Thirteen human placentas were analyzed in both the unprepared and dehydrated forms using X-ray fluorescence analysis for 15 heavy metals in order to address whether environmental metal accumulation in the placenta might affect the metal content of the dehydrated organ. Analysis revealed that unprepared placenta retained detectable concentrations of iron and rubidium, while dehydrated tissue contained higher concentrations of these metals in addition to zinc and strontium. These results suggest that while some beneficial metals are retained in the placenta in both forms, potentially harmful metals may also be retained, warranting further investigation of heavy metal accumulation in placental tissue. Further analysis in mothers regularly exposed to smoke inhalation is needed to address the effects of smoke exposure on placental metal accumulation.
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Post-Pleistocene gracilization and the effects of terrain on the lower limbs of modern humans

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Modern humans demonstrate a decrease in lower limb robusticity throughout the Pleistocene, particularly with respect to anteroposterior rigidity of the femur and tibia (review in Holt, 2003). This trend continues into the Holocene, and it has been interpreted as the consequence of subsistence changes and technological advances that reduced the human work load (Ruff, 2008; Ruff et al., 1993). However, analyses of human remains spanning 19-4 ka in Italy (Marchi, 2008; Marchi et al., 2011) deviate from this trend, with a Ligurian Neolithic sample demonstrating unusually robust lower limbs that are reminiscent of highly-mobile Late Upper Paleolithic humans from the region. These relatively high levels of robusticity have been associated with mountainous terrain and intensity of mechanical loading.

The current analysis evaluates diachronic changes in lower limb robusticity for regional samples to evaluate the hypothesis that there was a post-Pleistocene decline in lower limb robusticity. Cross-sectional geometric properties are evaluated for Late Pleistocene, Holocene and modern human samples in Europe, Africa and Asia to evaluate *in situ* changes in each region. High levels of robusticity in several Holocene samples suggests that a post-Pleistocene decrease in robusticity may represent sampling bias rather than a biological trend. Femoral and tibial shape indices demonstrate significant associations with terrain and consequently types of loading on the lower limb, although measures of long bone rigidity demonstrate significant sexual dimorphism. It is less clear, however, how these correlations should be interpreted from a behavioral or subsistence strategy perspective.

A novel method of estimating facial ancestry using 3D images

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Genomic ancestry can be a useful summary statistic for example as a variable in augmenting assessments of medical risk, in genetic association studies, and for constructing genealogies. Obtaining these estimates are in some cases not possible due to unavailability of genetic material in addition to time and cost limitations. Here we demonstrate a workflow to calculate facial ancestry and show that it is highly correlated with genomic ancestry.

A dense mesh of 7150 quasi-landmarks was mapped on 3D images obtained for a sample of

849 individuals with varying levels of West African and European ancestry. Principal components on the aligned x, y, and z coordinates of the quasi-landmarks were carried out to construct a multi-dimensional 'face space'. West African and European consensus faces were constructed from the face space by averaging across 80 African and 80 European individuals respectively. The Malhabanobis distance between each face and the African consensus face was divided by the sum of the Malhabanobis distances of the face from the African and European consensus faces to get facial ancestry along the African European axis. Here we report that this ratio is strongly correlated with genetic ancestry which was calculated from a panel of 68 ancestry informative markers (r2 = 0.531), as well as RIP-A, another measure of facial ancestry calculated using a partial least squares regression method (r2 = 0.624).

This method can be used to estimate facial ancestry where genetic material is not available.

When is a chirp more than a chirp? Characterization of a vocal call class in Ma's night monkey (*Aotus nancymaae*)

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Vocal calls have been extensively studied in the primate Order where they have been demonstrated to serve a pivotal role in primate communities. Primate vocalizations can communicate a variety of information including potential threats, internal states, and social status between conspecifics. We examined a vocal call class, referred to as "chirps", in Ma's night monkey (*Aotus nancymaae*), a poorly studied nocturnal primate. Our subjects consisted of seven pairs of monkeys housed in cages in a wooded area at the DuMond Conservancy for Primates and Tropical Forests in Miami, Florida. We recorded the subjects' vocalizations while cages were presented with a random sequence of four stimuli: owl vocalizations, a plastic snake wiggling by the cage floor, an experimenter walking by with a kennel, and a bright light.

Spectral and temporal analyses of the 421 chirps collected revealed that this call class comprises several distinct call types characterized by their shape on a sonogram. Moreover, call traits (e.g. starting frequency, peak frequency) appear to be pair-specific. The rate of chirps increased from an average of 16 per minute to 73 per minute during presentation of the snake and often caused similar increases in rate in nearby cages. Individuals remained silent while owl vocalizations were being played. These data suggest that while night monkeys have adopted a nocturnal lifestyle, their vocalizations show a range of variation comparable to diurnal primates, presumably like their ancestors. More research, particularly playback experiments, is needed to elucidate the possible functions of these call types.

Lower Pleistocene hominid paleobiodiversity in Southeast Asia: Evidence for a Javanese pongine taxon

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The Pleistocene deposits of the Sangiran Dome, at Java, have yielded over 200 hominid dental remains. Most of this material, predominantly consisting of permanent molars, is commonly attributed to *H. erectus*, even if some robust specimens have been tentatively allocated to other nonhuman taxa (*Meganthropus paleojavanicus, Pithecanthropus dubius, Pongo* sp.). Besides the impact of the intermittent glacio-eustatic fluctuations occurred along the Pleistocene on the evolutionary dynamics and variation patterns, this taxonomic uncertainty reflects the convergence in molar crown size and morphology between *Homo* and the Ponginae, notably in case of worn specimens.

In order to assess the hominid paleobiodiversity at Java during the Lower-Middle Pleistocene, we characterized by X-ray microtomography the 3D structural morphology of the M2 and M3 of the mandibular fragment Arjuna 9 ('Grenzbank Zone' of Sangiran). Because of its large dimensions and primitive morphology, this specimen was firstly compared to *M. paleojavanicus*, but later allocated to *H. erectus*. In the tooth endostructural analyses, we compared Arjuna 9 to the evidence from five permanent *H. erectus* molars from the Kabuh Formation of Sangiran and to a number of specimens representing extant and fossil humans (North African *H. heidelbergensis* and Neanderthals) and extant and fossil *Pongo*.

Results dealing with dental tissue proportions, enamel thickness distribution and geometric morphometrics of the enamel-dentine junction show that Arjuna 9 sets apart from the human pattern, notably from *H. erectus*, and more closely fits the pongine condition, thus pointing to a more complex Lower-Middle Pleistocene hominid paleobiodiversity at Java than previously thought.

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Prosimian primate life history profiles generated from the new Duke Lemur Center Database (coming soon to a URL near you!)

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Here we introduce the new Duke Lemur Center Database, an extraordinary and soon-to-be publicly available life-history resource for a phylogenetically diverse assemblage of endangered primates. To demonstrate the breadth of information therein, we present life history summaries, based on precise data and large sample sizes, describing 23 variables relating to longevity, reproduction, and body size in 25 captive prosimian primate species. Since its establishment in 1966, the DLC has been dedicated to the study and conservation of prosimians, with special interest in the lemurs of Madagascar. Data, including birth, death, reproductive, weight, husbandry, and medical records, have been collected throughout the history of the center, and the DLC database contains detailed information for over 4100 individuals representing 39 taxa. Until the development of this database, those data have been largely inaccessible to the research community. To remedy this, we have extracted colony information from extant captive animal databases from which data are difficult to retrieve and impossible to analyze (ARKS, MedARKS, and ZIMS), and combined it with a variety of previously non-databased in-house records using SAS® Enterprise Guide® software to produce a user-friendly analytic database. Our presentation outlines various methods by which investigators can freely access these data and provides an overview of direct and calculated variables now available. Furthermore, the data-rich life history profiles generated highlight the high levels of biological diversity observed among closely related prosimian species, and will provide a solid foundation on which a wide variety of future biological studies can be built.

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Developmental timing of heel-strike plantigrady in chimpanzees and gorillas

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Understanding the mechanics of African ape locomotion has important implications for scenarios of hominoid locomotor evolution. Ontogenetic differences between chimpanzees and gorillas in knuckle-walking frequencies and postures and the development of the manual skeleton support an independent evolution of knuckle-walking in apes. African apes also use heel-strike plantigrady (HSP) in which the heel makes initial contact with the substrate. Little is known about the relationship between knuckle-